

STUDIES IN NEARCTIC DESERT SAND DUNE ORTHOPTERA

Part XI. A new arenicolous species of *Stenopelmatus*
from Coachella Valley with Key and biological notes.

Ernest R. Tinkham*

The discovery of a new Jerusalem Cricket inhabiting a very small segment of the sand and dune areas of Coachella Valley did not come easily. In fact, I had been collecting in Coachella Valley since 1952, and including my National Science Foundation grant years, 1957-1960, before the discovery was made. Part of the credit for the find goes to my Beaumont Class in *Nature Study of the Desert*, an extension course offered by San Diego State College under my instructorship.

It was a night one shouldn't take out a class of teachers. The world was calm at Beaumont when we left before sundown but by the time we arrived at the Palm Springs Depot, 10 miles west of Palm Springs, California, the wind was howling and cold and the sand flying. I asked them if they wished to return to the sanctuary of their homes or face the elements. They were game and chose the latter.

We went south from the depot, crossed some sand dunes, a very broad arroyo bed and a much broader expanse of desert grass (*Oryzopsis hymenoides*) to some larger undulating dunes piled up at the north base of the San Jacinto mountains. There was less wind here and the night was not too unpleasant. The discovery of the first Jerusalem Cricket came as a great surprise. Three specimens were taken that Saturday night in early May, 1962, and all were half-grown and medium in size. They were placed in oatmeal cartons and kept alive and studied for months to learn as much as possible about their biology.

Despite additional nights out on these dunes in the past six years, very few additional specimens have been found.

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The Key, description and biological notes follow.

PROVISIONAL KEY TO THE STENOPELMATINE CRICKETS OF CALIFORNIA

1. Tibial spines, vestigial or missing on the apical dorsal margins of the caudal tibiae. Ringlet of 6 apical caudal calcaria almost even and broadly spathulate for arenicolous habitus. Median or presubapical spur on the ventral surface of the foretibiae absent. Pronotum not expanding anteriorly. Size medium; coloration uniformly orangish

*Indio, California.

..... *Ammopelmatus kelsoensis* Tinkham

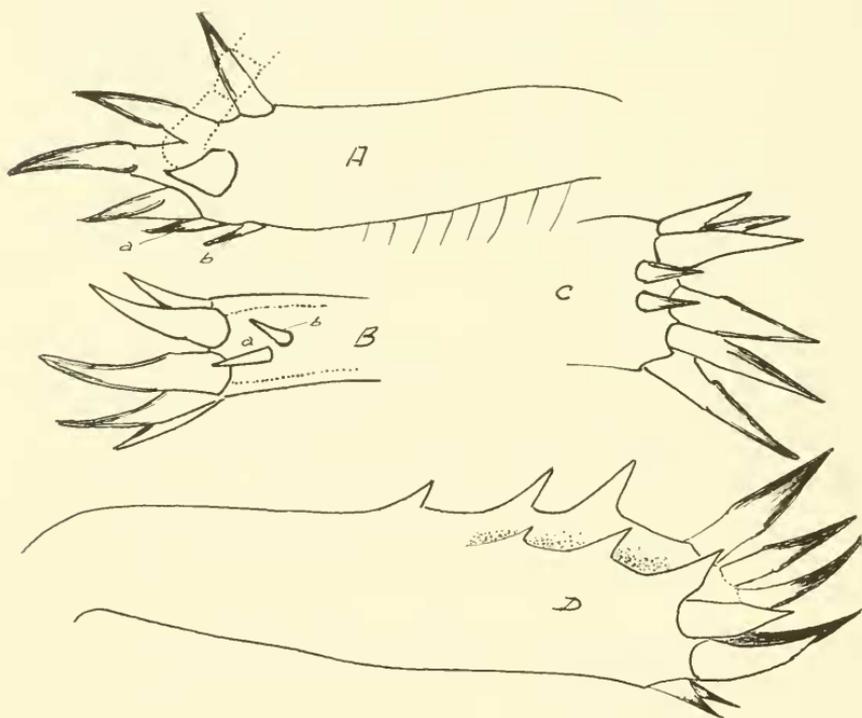
Tibial spines prominently developed on the apical dorsal margins of the caudal tibiae. Ringlet of 6 apical caudal calcars uneven in length, usually conical or subconical in form, the innermost calcar the longest. Median or pre-subapical spur on the ventral surface of the foretibiae always present except in the new species herein described. Pronotum expanding anterioradly to house the posterior portions of the large head except in the new species herein described. Size medium to very large; coloration often dark to orangish; the abdomen darkest

..... *Stenopelmatus* Burmeister (2)

2. Foretibiae bearing only two ventral apical spurs immediately posterioradly of the third and fourth calcars. Caudal tibiae with three dorsal apical or subapical teeth on each margin. Size large, coloration orangish *cahuilaensis* n. sp.
 Foretibiae bearing 3 ventral apical and sub apical spurs, the first two somewhat paired and proximal to the third and fourth calcars, the third subapical in position. Caudal tibiae with a variable number of dorsal apical or subapical teeth on each margin. Size small to very large, coloration dark often with black on head and pronotum in characteristic conformations 3
3. Size large; color of head and pronotum orange red. Head often megacephalic 4
 Size medium to small; color of head and pronotum not orange-red but piceus to shining black; the black isolated into irregular areas by pale sutures 5
4. Calcars of the caudal tibiae forming a semi-ringlet of 6 long spurs, the two innermost much the longest and cylindrical in form *longispina* Brunner
 Calcars of the caudal tibiae forming a semi-ringlet of 6 spurs, these spatulate or trowel-shaped on their inner faces; the three inner relatively equal and longer than the 3 outer spurs or calcars *fuscus* Haldeman
5. Entire body uniformly dark brown with black abdominal tergites. Caudal tibiae with 5 internal and 2 external apical dorsal teeth *intermedius* Davis & Smith
 Upper half of head shining black with tan sutural areas. Pronotum with dorsum bearing irregular areas of shining black. Femora marked with pale fasciations. Caudal tibiae with 3 to 4 internal and 2 external apical dorsal teeth *pictus* Scudder

Stenopelmatus cahuilensis n. sp.

Size large for the genus; as the only arenicolous species of *Stenopelmatus* it is recognized from the other Californian species by its orangish coloration, narrow pronotum throughout and certain important chaetotaxical characters. These are: Foretibiae with only two ventral apical spurs whereas all previously described species have three, one of which is subapical in location. Like other species of *Stenopelmatus* in California, the caudal tibiae bear a large pair of ventral apical spurs immediately proximad to calcars 3 and 4. In another new species, description of which is in press by Tinkham and Rentz, this new black-capped species has only one ventral apical spur on the caudal tibiae, as well as only the one pair of



EXPLANATION OF PLATE

All drawings of the holotype male of *Stenopelmatus cahuilensis* Tinkham n.sp. greatly enlarged.

A. External view of left fore tibia showing the five calcars and the two ventral apical spurs (a) and (b).

B. Ventral view of left fore tibia showing the pair of ventral apical spurs in relation to the five calcars.

C. Ventral view of apical portions of the left caudal tibia showing the relationship of the pair of ventral apical spurs to the six calcars.

D. External view of the entire caudal tibia showing the three external and three internal dorsal teeth, the six calcars and the ventral pair of apical spurs.

ventral subapical spurs on the fore tibiae. The possession of two ventral apical spurs in a pair on both fore and caudal tibiae will amply distinguish this new species, herein described, from all the other Californian species described or being described.

HOLOTYPE MALE.— 1 male, Palm Springs Depot, Riverside County, California, dunes at north base of mountains one half mile south of depot across wash. Nov. 16, 1963, died Feb. 7, 1964. Collector Ernest R. Tinkham. Type deposited in the Tinkham Eremological Collection.

DESCRIPTION: Size large for the genus. Head large, occiput strongly globose but not megacephalic, clypeal groove to apex of occiput 9.8 mm., from clypeal groove to apex of mandibles 6.2 mm.; breadth of face 10.8 mm. Eyes small, inverted pyriform, inner margins 6.4 mm. apart. Antennae short, barely reaching to the anterior base or segments of the abdomen.

Pronotum with lateral margins anteriorly, not at all expanded or ampliate, but parallel; the posterior half broadly and evenly rounding into the posterior margin which is straight. Anterior margin roundly excavate and typically ciliate with short golden hairs. Dorsum of the pronotum with a shallow, longitudinal, median groove in the posterior three-quarters of the pronotum. There is also a transverse depression on the anterior quarter, another transverse groove centrally which curves forward laterally and at the posterior two-thirds there is a short transverse line for half the breadth of the pronotum. Prosternum with the typical transverse wedge-like process characteristic of the genus.

Abdomen typical; genitalia with supranal plate triangulate, with a slight median transverse depression. Uncinate hooks of the cerci normal and located at the extreme lateral bases of the plate. Cerci bluntly acuminate, medium in length, hirsute. Subgenital plate with the posterior margin broadly and evenly rounded.

Leg spination as follows: fore legs typical in form, fore femora unarmed; fore tibiae with the diagnostic slightly uneven pair of ventral apical spurs. Calcars five, large, the three inner ones the longest and spathulate; the two outer shorter of which the last or fifth is by far the shortest (see fig.). Fore tarsi typical of the genus. Mesolegs with the mesofemora unarmed; mesotibiae with a large pair of even ventral apical spurs at the bases of calcars 3 and 4. There are in addition two subapical spurs, one on each margin and the right mesotibiae has an additional spur, centrally located and just basad of center. Mesotarsi typical. Caudal legs with the femora typical. Caudal tibiae with usually a large pair of ventral apical spurs although in the Type the right pair is missing. Calcars six; the three inner much the longest, their inner apical surfaces spathulate. Dorsal apical teeth usually three on each margin; the external three more closely arranged than the inner three. The Type has also a small extra tooth located about midway along the dorsal inner margin. Caudal tarsi typical.

Calliper measurements of holotype male in millimeters: total length 33.7; pronotum 10.2 in breadth x 7.4 in length; pronotal

depth 4.8; caudal femur 12.6 x 4.3; caudal tibia to base of calcars 11.0; subgenital plate 2.5 in length x 4.4 in width.

PARATYPE MALES.— 4 collected at the Type Locality as follows: 2 males May 1, 1962 and reared as indicated in Life History Studies as "B" and "C." 1 male collected Nov. 16, 1963, and 1 half-grown male collected as a second stadium nymph on July 2, 1964 and died July 1965. 1 male collected at the Palm Springs Airport on April 6, 1968, by Dr. Raymond H. Ten Pas.

Paratypes identical to holotype in every respect except that in "B" and "C" (reared specimens), the terminal tarsal segments and the ungues are atrophied. This may have been due to inactivity in the cartons or in the case of "C" may have resulted from disturbance or handling immediately following ecdysis.

Range in millimeters in paratype males is as follows: Total length 33.5 to 37.5; pronotum 8.5-9.5 in breadth x 6:5-6.9 in length; caudal femura 10.5-12.2 x 4.3 in depth; caudal tibiae to base of calcars 9.4-10.8 mm.

HABITAT: rolling sand dune ridges, one above the other, and running parallel to the north base of the San Jacinto mountains. Dune shrubbery typical of Colorado Desert. Enormous clumps of ancient creosote (*Larrea divaricata*) form many of the dune ridges. Desert Willow (*Chilopsis linearis*) is also present and forms similar mounds. *Ephedra* or Mormon Tea is also present.

When winter rains have been adequate, the spring flowers are typical of the dunes elsewhere in Coachella Valley. The Dune Primrose (*Oenothera deltoides*) make colorful displays and scent the night air. Brown-eyed Primrose (*Oenothera clavaeformis*), Spectable Pod (*Dithyrea californica*), *Cryptantha micrantha* and *costata*, *Coldenia plicata* forming mats on the sand, wild Rhubarb (*Rumex hymenosepalus*), Sandpaper bush (*Petalonyx Thurberi*) and many other rarer forms are to be found.

ORTHOPTERAN ASSOCIATES: The orthopterans of this area are rather few. In the spring the chief orthopteran is the Giant Sand Treader (*Macrobaenetes valgum* Strohecker) that is to be found occasionally in the spring until late May or early June. The diurnal associates of the area are *Xeracris minimus* on *Petalonyx Thurberi* and *Coniana snowi* on the sand mat *Coldenia plicata*. *Trimerotropis p. pallidipennis* is also present.

LIFE HISTORY STUDIES

The complete life history of this new species of *Stenopelmatus* dwelling on certain sections of drift sand and sand dunes in the western end of Coachella Valley is compiled from studies on a very young nymph and several half-grown individuals.

On the hot night of July 2, 1964, I arranged to meet and help two men representing a new photographic company they were forming in Los Angeles, at the Palm Springs Depot. I was to assist them in taking movies of night life on the dunes and for my services was to receive a duplicate of several hundreds of feet of the movie

film taken, which was never received. I brought along a sidewinder and other living specimens to make sure of a successful evening. The only recompense I received was the discovery of a young nymph of *Stenopelmatus calhilaensis* Tinkham n.sp. I was distinctly surprised and delighted to obtain evidently a second stadium nymph of the new species I was anxious to study. The nymph measured between 11 and 12 mm. in length and like all dune biotae undoubtedly emerged from the egg with the advent of the winter rains, probably in late February or early March. The nymph lived for a year and was half grown when it died. Following is the biological record.

July 2, 1964—second stadium nymph discovered on a small dune ridge devoid of vegetation, on a hot night within half an hour of sundown. Length between 11-12 mm.

Sept. 26, 1964—sand in bottom of large oatmeal carton sifted through fine wire mesh to recover any possible parts with negative results.

Oct. 20, 1964—sand sifted—negative results.

Oct. 22, 1964—found complete freshly cast skin or exuvium of 2nd stadium Calliper measurements in millimeters: caudal femora 3.8, caudal tibiae 3.5 to base of calcars.

Nov. 22, 1964—found complete cast skin.

Dec. 19, 1964—examined—negative results.

Feb. 10, 1965—11:30 p.m. when went to feed it lettuce as I did every night, found the nymph in the process of ecdysis. At this time it was lying completely on its back and starting to work its way out of its exuvium. At 11:45 the forelegs had been extricated and by 12:05 midnight it was almost half out.

Feb. 11, 1965—At 8:45 a.m. it was out of its skin but still lying on its back. The exuvium was lying ventral side up. A few minutes later it was on its feet as a result of the examination. Measurements: caudal femur 5.3; caudal tibia 4.2. The complete 4th stadium exuvium was removed and preserved; otherwise it is usually devoured.

April 5, 1965—sifted sand with negative results.

June 27, 1965—as above.

July 18, 1965—found dead—may have been poisoned on lettuce. Measurements of 5th stadium male nymph well preserved in alcohol. Total length 27.3; breadth of head 4.9; pronotum 5.1 in breadth x 3.9 length; caudal femur 6.1; caudal tibia to base of calcars 6.2 mm. This nymph was about the size of the three nymphs collected on May 1, 1962, on which notes are presented below.

“A” half-grown nymph collected May 1, 1962, on dunes about one-half mile south of Palm Springs Depot. Fed small piece of lettuce every night when specimen examined.

Sept. 23, 1962—molted about 11 p.m. At 11:20 p.m. it was lying upside down. Thought for a moment it was dead until I saw the cast skin which was still damp. The weather was very humid

- and at 11:40 p.m., the room temperature was 26.0° C; the inside of the carton was 25.8° C. The dorsum of the exuvium was spit from the upper level of the eyes to the base of the first abdominal segments. The mouthparts are drawn far under the exuvium at ecdysis. The exuvium took several days to dry out in the carton in the humid weather. Measurements by callipers in millimeters: pronotal length 6.1 (pronotal breadth cannot be measured due to the split parts); caudal femur 9.6; caudal tibia 8.3 to base of calcars. It is unwise to try to measure the freshly emerged living nymph.
- Oct. 8, 1962—living nymph measured 40.0 mm. in total length.
- Oct. 16, 1962, 3:50 p.m.—Heard a tapping within the carton at a distance of 8 to 10 feet. Tapping made by abdomen hitting the sand in the bottom of the carton; quite loud at a distance of four feet. Since the carton is dark at all times is this the way the female has in attracting the male to it?
- Oct. 24-25, 1962—Heard considerable tapping in the middle of each afternoon. More tapping may have gone on but I was not home every afternoon.
- March 8, 1963—found dead.
- “B” half-grown male nymph collected May 1, 1962 on dunes about one half mile south of Palm Springs Depot. Fed and examined daily.
- July 24, 1962—7:00 p.m., found molting with skin attached.
- Oct. 1, 1962—11:35 p.m., found lying sternum up. Room air was 26° C. as the cooler had just been cut off. Temperature within carton was 24.6° C. Cast skin when removed was dry so molting had occurred in the early evening. Measurements of exuvium: pronotal length 7.3; caudal femur 11.2; caudal tibia 10.4 mm.
- Oct. 8, 1962—measured 40.0 mm. in total length—living.
- Feb. 26, 1963—found dead; measured 36.0 mm.; with head stretched forward, 40.0 mm.
- “C” half-grown male nymph collected May 1, 1962 on dunes about one-half mile south of Palm Springs Depot. Fed and examined daily.
- July 25, 1962—molted. Sand and air temperature in carton 17.8° C. cast skin present.
- Oct. 8, 1962— 11:20 p.m., room temperature 26° C; bottom of carton 24.0° C. nymph found lying on back sternum-up. Cast skin was behind the nymph and dry when it was picked up. Length of nymph 32.0 mm. Nymph very touchy and quick—ready to fight.
- Oct. 13, 1962—nymph not doing very well, lying on side, somewhat shrunken.
- Oct. 15, 1962—nymph dead. size had shrunk to 26.0 mm. (mostly shrinking of the abdomen). It is suspected that measuring the freshly emerged nymph on Oct. 8. may have accounted for its

premature death as the other two nymphs lived almost half a year longer.

1 male paratype was collected on Nov. 16, 1963 and died in March, 1964. This was a good fall for dune insects since there had been good rains in September and the dunes remained damp or wet all fall and winter.

1 male paratype was collected April 6, 1968, by Dr. Raymond L. Ten Pas at the Palm Springs Airport and died May 22, 1968.

LIFE HISTORY SUMMARY

From the evidence presented the life history of *Stenopelmatus cahulaensis* Tinkham n.sp. is as follows. The ova are probably deposited in the spring of the year as are those of the sand treaders of the genera *Macrobaenetes* Tinkham and *Ammobaenetes* Hubbell. Whether they hatch that same spring or in the fall after the advent of late summer or early fall rains is not known at present.

The evidence presented does indicate that the nymph takes two full years to mature and that the adult lives at least half a year after maturity is reached. There are at least 7 stadia in the male and perhaps there would be an additional one in the female so that from egg to death of adult can be fully three years or more. This is one year short of the four years of *Ammopelmatus kelsoensis* of the Gila Desert at an elevation of 2500 feet. Perhaps the hotter year-round temperatures of the Colorado Desert account for the shorter life span but even at that three years for an orthopteran is a remarkably long time.

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